



Commercial Air Conditioners and Heat Pumps

MARKET AND TECHNOLOGY ASSESSMENT

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Arthur D. Little, Inc.

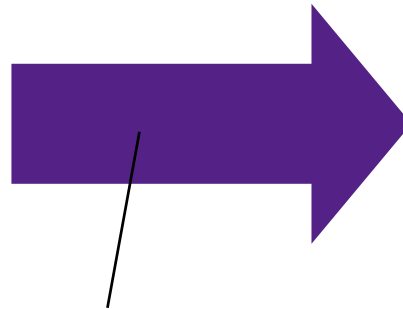
U.S. DOE Workshop on Standards
for Commercial Air Conditioners and Heat Pumps
October 1, 2001



Market Assessment Overview

The information collected during the Market and Technology Assessment is fundamental to several downstream analyses.

**Market and
Technology
Assessment**

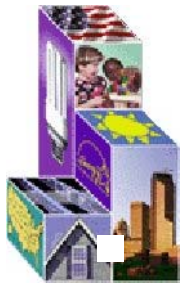


Screening Analysis

National Energy Savings

***Manufacturer Impact
Analysis***

**Firms and industry structure
Product characteristics
Historical shipments
Non-regulatory incentives
Regional differences**



Market Assessment Information Sources

The Department is currently gathering information from the following sources:

US DOE Commercial Building Energy Consumption Survey,
1992, 1995, and 1999
Product Technical and Sales Literature
US Census Current Industrial Reports
SEC 10-K Annual Reports
ARI Statistical Profile, 2000
ARI Large Unitary Products Directory
California Energy Commission database

What additional sources should the Department consider?

Are the stakeholders willing to provide more detailed information?



Market Assessment Specific Topics

The market assessment raises several important questions.

- *Should the Department consider regional differences in product distribution, use, or installation? If so, which ones?*
- *What assumptions regarding the impact of non-regulatory initiatives (e.g. ASHRAE 90.1-1999, Energy Star, utility rebates) should DOE use in the analysis?*
- *Are there any impending changes in the market of which the Department should be aware?*



Product Classes

Proposed Product Classes

Separate classes of air conditioners and heat pumps can be established in order to accommodate differences in product efficiency and to preserve consumer utility.

- ***Are the following classes appropriate?***
 - AC (cooling-only) (≥ 65 and < 135 kBtu/hr)
 - AC (cooling-only) (≥ 135 and ≤ 240 kBtu/hr)
 - Heat Pump (≥ 65 and < 135 kBtu/hr)
 - Heat Pump (≥ 135 and ≤ 240 kBtu/hr)
- ***Are additional classes warranted based on unique features that impact energy use (e.g. heat recovery) or utility (e.g. dehumidification)?***



Baseline Models Overview

The Department defines baseline model characteristics to serve as the basis for the analysis.

- Includes capacity, configuration, efficiency, and features
- Usually based on the most commonly sold minimum efficiency product in each product class
- Serves as the basis for cost and performance estimates that are intended to represent the “typical” product



Baseline Models Overview

Based on the market assessment, the Department suggests using the following characteristics to define baseline air conditioners and heat pumps for the analysis.

Packaged, year-round (for cooling-only systems)

<135kBtu/hr:

7.5 tons, 8.9 EER, 3.0 COP

8.0 IPLV

single compressor

≥ 135 kBtu/hr:

15 tons, 8.5 EER, 2.9 COP

8.0 IPLV

dual compressors

- Are these features/levels appropriate? Should other features be added?*
- Are multiple baseline units (e.g. more than one capacity) needed within a class?*
- Should comparable analysis be performed for other product types (e.g. split systems, or systems without integral gas heat)?*



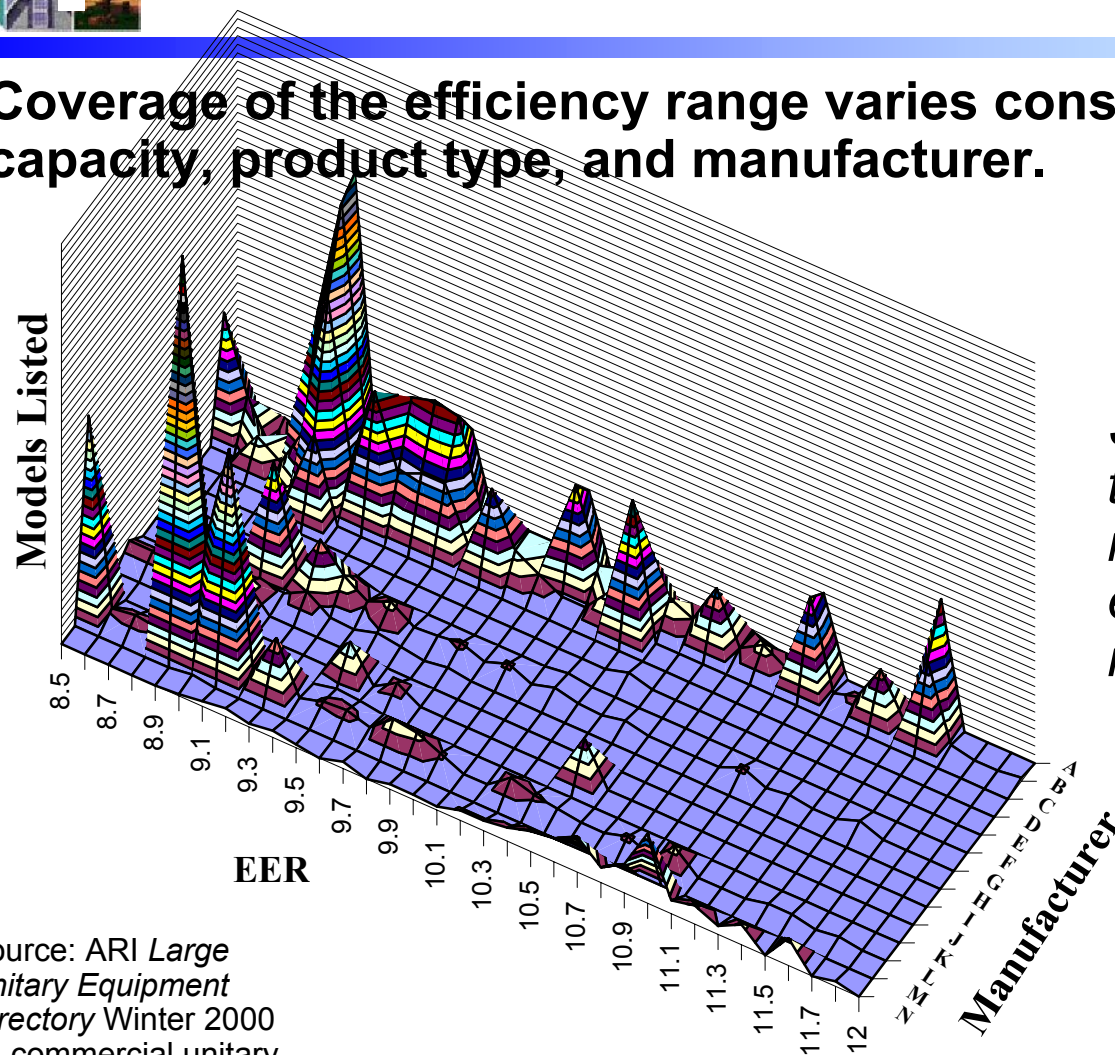
Backup slides



Baseline Models

Product Capacity (Input Rating)

Coverage of the efficiency range varies considerably by capacity, product type, and manufacturer.



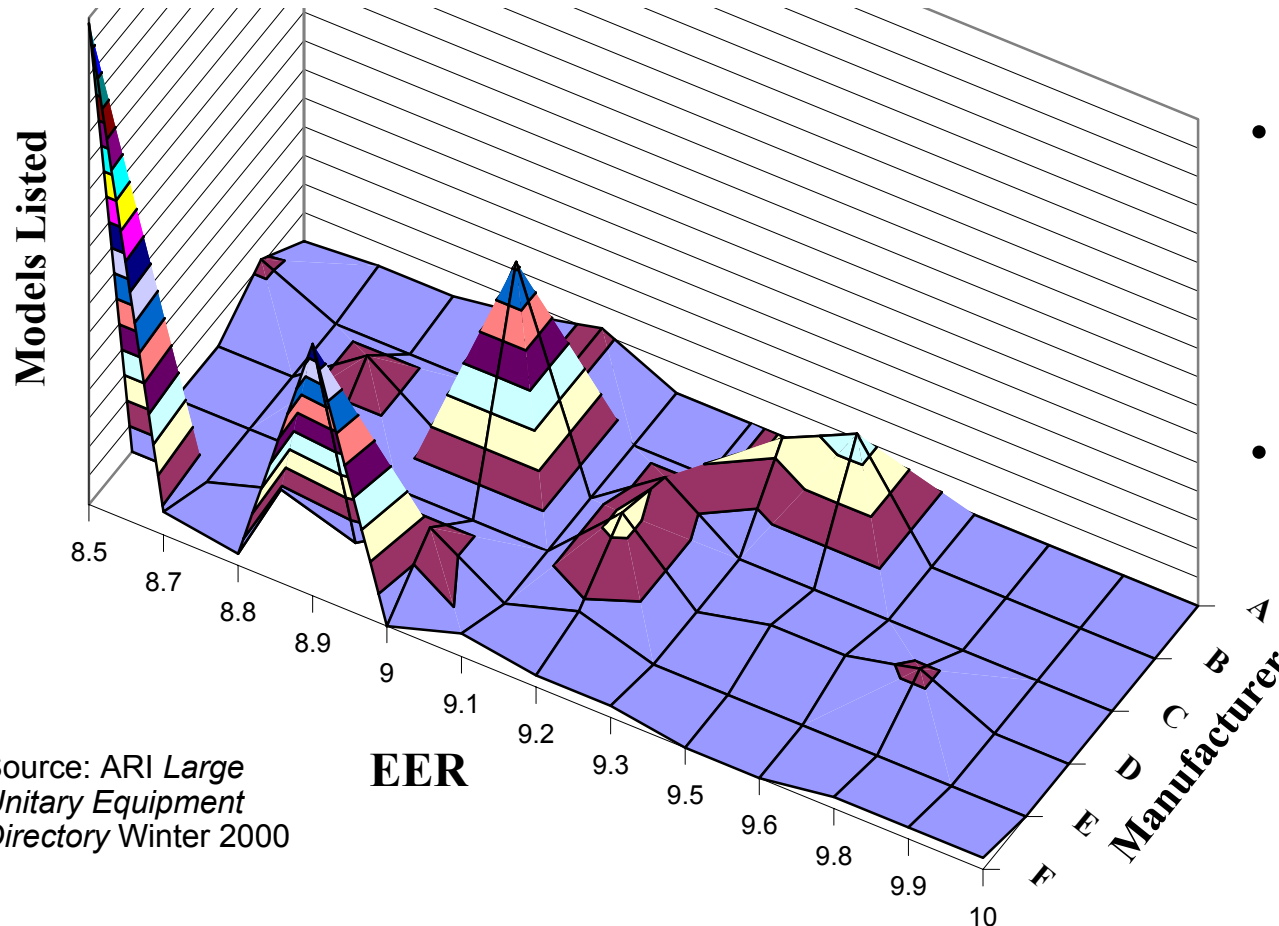
Should this cause the Department to rely less on actual equipment data and more on modeling?

Source: ARI Large Unitary Equipment Directory Winter 2000
All commercial unitary equipment shown.



Baseline Models Product Efficiency

Only a few manufacturers produce split systems $\geq 135\text{kBTU/hr}$, and the most efficient system attains only 10 EER.



Source: ARI Large
Unitary Equipment
Directory Winter 2000

- *Is this relatively low efficiency limit due to technical or market factors?*
- *How should the Department consider these factors in this rulemaking?*